Discretization and optimal control of Lagrangian and Hamiltonian field theories

Department Maschinenbau (MB), Erlangen, TV-L E 13, Vollzeit, Befristete Anstellung, Bewerbungsschluss: 15.11.2024

Ihre Aufgaben

Description

Classical Lagrangian and Hamiltonian field theories are at the core of continuum mechanics, electromagnetismand general relativity. These theories have a rich geometric structure of which multisymplecticity may provehighly valuable when performing numerical simulations.The structure of optimal control problems is analogous to that of Lagrangian and Hamiltonian mechanics andfield theories. Therefore, the numerical treatment of these, particularly when applied to mechanical and fieldtheoretical systems, may benefit from the use of structure-preserving numerical methods.In this project we will study and develop high-order multisymplectic numerical integrators for continuum systemswith and without constraints. These discretisations will be then applied in optimal control problems. Wewill also attempt to imbue structure-preserving properties to non-preserving methods using neural networks.The project will be carried out in collaboration with our partner team at ICMAT in Madrid, Spain whose expertise in geometric mechanics is well-known.

Ihr Profil

Notwendige Qualifikationen:

- Highly motivated candidates with degrees in mathematics, physics, engineering, computer science, or related fields.
- Knowledge of analytical mechanics, differential geometry, numerical methods and programming.
- Good written and oral communication skills in English (German desirable).

Interessiert?

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